Evaluation of the Effectiveness of Competency – Based Formative Assessment Tool for the Skills in Community Medicine Training of Undergraduate Medical Students

Synopsis of the thesis to be submitted for the award of the degree of Doctor of Philosophy in

FACULTY OF HEALTH PROFESSIONS EDUCATION

Submitted to

SRI BALAJI VIDYAPEETH

Submitted by

Dr. V. PRAGADEESH RAJA

UIN: 1905001015

Under the guidance of

Prof. Dr. M. SHIVASAKTHY

Director, Institute of Health Professions Education

Sri Balaji Vidyapeeth, Puducherry.

TABLE OFCONTENTS

S. NO	CONTENTS	PAGE NO
1	INTRODUCTION	1
2	AIM AND OBJECTIVES	3
3	RESEARCH QUESTION	3
4	REVIEW OF LITERATURE	7
5	METHODOLOGY	9
6	RESULTS	16
7	DISCUSSION	23
8	SUMMARY AND CONCLUSION	26
9	ABSTRACT	27
10	REFERENCES	28

INTRODUCTION

1.1 Background of the study

The Department of Community Medicine (CM) in medical colleges focuses on teaching and training medical students with an aim to ensure value-based education and help in molding a basic doctor of first contact. The functions of a doctor include caring for the individual, caring for the community, and serving as a teacher.[1] The Bhore committee recommended the need for training of "basic doctors" as those who will not only provide basic clinical care but will also engage with the community in priority setting and identifying solutions to common health issues.[2] The chief objectives of the CM programme are to ensure value education to the undergraduate student through service to marginalised groups, strengthen skills and attitude input to help them serve later as practical doctors and leaders in society.[3]

At the end of the undergraduate program, the Indian Medical Graduate should be able to: (a) recognise "health for all" as a national goal and health right of all citizens, and by undergoing training for the medical profession, fulfil his/her social obligations towards the realisation of this goal. (b) learn every aspect of National policies on health and devote herself/himself to its practical implementation. (c) achieve competence in practice of holistic medicine, encompassing promotive, preventive, curative and rehabilitative aspects of common diseases. (d) Develop a scientific temper, acquire educational experiences for proficiency in a profession, and promote healthy living. (e) become exemplary citizens by observance of medical ethics and fulfilling social and professional obligations, so as to respond to national aspirations. These objectives can only be achieved by competency-based medical Education[4].

Competency is defined as "the ability to do something successfully and efficiently".[5] CBME is an approach to ensure that the graduates develop the competencies required to fulfil the patients' needs in society. It de-emphasises time-based training and promises greater accountability, flexibility, and learner-centeredness.[6] Recent trends in medical education are rushing away from gaining a certain number of marks in high-stakes examinations and towards gathering evidence of clinical competence and professional behaviour daily in the workplace.

Assessment refers to a systematic approach for gathering information about student learning through various methods and procedures. Since the 1950s, the process of assessment in medical education has undergone rapid and significant evolution. Assessments are typically categorized into two subtypes: formative assessment (FA) and summative. Both methods aim to evaluate a student's ability.

Formative assessments serve as a training tool, used to identify a trainee's strengths and, more importantly, the areas in which they need to improve their performance and develop their skills.[7] The feedback plays a vital role in the formative assessment and is connected to deep learning. Feedback has been defined as "an informed, non-evaluative, and objective appraisal of performance intended to improve clinical skills".[8]

1.2 Need for the study

Competency-Based Medical Education (CBME) has recently been implemented in India for undergraduate medical students in 2019. Formative assessment is a key component of CBME as it focuses on identifying and addressing gaps in knowledge, skills, and attitudes through continuous evaluation and constructive feedback. Unlike summative assessments, which evaluate learning at the end of a course, formative assessments aim to guide students during the learning process and help them improve in real-time. Given the diverse range of skills required in community medicine, there is a pressing need for innovative and effective assessment tools tailored for formative evaluation. The National Medical Commission promotes formative assessment.

The CBME curriculum for 2019 does not include a certified competency in community medicine. The study focuses on evaluating two tools: Case-Based Discussions (CBD) and Direct Observation of Public Health Practices (DOPHP). These methods aim to assess and enhance the skills of undergraduate medical students in community medicine.

1.3 Statement of the study

Evaluation of the effectiveness of Competency-based formative assessment tool for the skills in Community Medicine training of undergraduate medical students.

1.4 Aim of the study

To evaluate the effectiveness of a competency-based formative assessment tool for the skills in Community Medicine training of undergraduate medical students

1.5 Objectives

Primary objectives

1. To implement the formative assessment tool during the community medicine posting of the students.
2. To compare the student performance trained with and without the intervention.

Secondary Objectives

1. To evaluate the relationship between the number of formative assessment sessions and OSCE performance.
2. To compare the traditional and competency-based medical education batch students in OSCE performance
3. To collect faculty and student feedback on the feasibility, utility, and effectiveness of formative assessment tools in community medicine training.

1.6 Research Question

Does the utilization of an indigenous Competency-based formative assessment tool change the level of performance of undergraduate medical students when compared to traditional training?

1.7 Study variables

The study includes the following variables

Independent variables: The implementation of the competency-based formative assessment tool, Case-Based Discussion (CBD), and Direct Observation of Public Health Practice (DOPHP).

Dependent Variables:

1. Student Performance in the Objective Structured Clinical Examination (OSCE), primary outcome.

2. Attendance rates in CBD and DOPHP sessions

3. Feedback scores from students and faculty on the feasibility and utility of the tools

1.8 Operational definitions

Competency-Based Medical Education: An educational approach where training is structured around predefined competencies (knowledge, skills, attitudes)

Competency-Based Formative tool: Measure predefined skills, knowledge and attitudes (e.g communication skills, clinical reasoning) required for effective community medicine practice

Formative Assessment: The students ' ongoing assessment designed to provide feedback and improve learning during the training process by the use of Case-based Discussions (CBD) and Direct Observation of Public Health Practices (DOPHP)

Students: The students who are all involved in the study, both control and intervention, MBBS students (Phase II and Phase III part 1 MBBS students), fulfil the inclusion and exclusion criteria

Assessors: The assessors have undergone the sensitization program conducted by the research scholar and participated in the training of the students, including the implementation of the formative tool and served as assessors in the OSCE

Case-Based Discussion: Structured discussion around simulated cases to assess the clinical reasoning and prevention of the diseases

Direct Observed Public Health Practice: Direct observation of students performing public health tasks in the simulated environment (health education, etc) with a checklist

Delphi Technique: A Structured method to derive expert consensus through iterative rounds of feedback. Here 4 rounds of Delphi with 6 experts to select 12 competencies for formative assessment, with consensus defined as ≥ 70% agreement (rating ≥ 4/5)

Objective Structured Clinical Examination (OSCE): A standardized, multi-station exam where students demonstrate skills in simulated scenarios. Here, 12 12-station OSCEs are validated by Experts, assessing competencies trained by a competency formative assessment tool.

Attendance: Students participated in the formative assessment sessions. Percentage of CBD and DOPHP attended (e.g 80% attendance = 4 out of 5 cycles completed)

Feedback: Feedback provided to students after each formative assessment cycle. Verbal feedback using predefined criteria. (e.g Kalamazoo scale for communication skills)

1.9 Assumptions

- The study assumed that Case-Based Discussion (CBD) and Direct Observation of Public Health Practice are appropriate and valid methods for assessing competency in community Medicine.
- It assumed that the 12 competencies selected by the Dephi method were comprehensive and relevant for undergraduate training.
- The study assumed that structured feedback from CBD and DOPHP would lead to skill improvement, aligning with CBME principles.
- The students who attended more sessions were more engaged and thus likely to perform better in OSCE
- The study assumed that the control and intervention groups were comparable in prior academic performance (Higher secondary marks, NEET score, Phase 1 MBBS marks)

1.10 Summary

This chapter introduces the research study, providing an overview of its background and rationale. The chapter presents the need for the study, the statement of the problem and the objectives. Additionally, it discusses the assumptions, research question and operational definition of key terms used throughout the study

REVIEW OF LITERATURE

I. Studies related to competency-based assessment

Van der Merwe et al. (2020)[9] conducted a descriptive cross-sectional study, aiming to evaluate the current clinical assessment practices in the undergraduate medical program. The study involved collecting both qualitative and quantitative data from teaching and learning coordinators across 13 disciplines. The results showed that while multiple-choice questions (MCQs) and OSCEs were frequently used, workplace-based assessments were less commonly implemented. The study highlighted that poor feedback and lack of post-assessment moderation were prevalent issues, and suggested a need for more formative assessments and a stronger emphasis on continuous assessment methods, especially for clinical competence.

II. Studies related to skills assessment in community medicine

Jeevithan Shunmugam (2015)[10] conducted a study on the assessment of competency in community medicine among medical students. The study focuses on assessing the competence of medical students across their course on select professional skills and to analyse the level of competence achieved with different phases in their curriculum. Trained and assessed the students, compared to the knowledge gained, the level of competence achieved in cognitive skills is relatively poor .The conclusion of the study is that assessment in medical education should emphasise formative evaluation, logbooks, and skill-based exams like OSCE, shifting from knowledge-focused to competency-based systems.

Yongming Zhang (2023)[11] conducted the study An effectiveness evaluation of a community-based course for medical students: a randomized controlled trial in the teaching of epidemiology. To evaluate the effectiveness of a short-term course for the teaching of epidemiology, which was designed as a community-based class for medical students. This course was designed according to Kern's six-step approach to curriculum development. A total of 75 undergraduates were recruited. Forty-one students were assigned to an experimental group engaged in theoretical teaching and practical courses, while 34 students were assigned to the control group, who only took theoretical courses. All participants were asked to complete a pre- and post-course survey and to take a test after completing the course.The experimental group showed

significantly higher self-assessment scores in course understanding (p=0.0126) and clinical practice skills (p=0.0005) after completing the course, while no significant difference was observed in the control group. They concluded the short-term practical course in epidemiology exerted significantly positive effects on the improvement of student learning enthusiasm, course understanding and clinical practice skills

III. Studies related to formative assessment

Farah Otaki et al (2023)[12] conducted Students' Perception of Formative Assessment as an Instructional Tool in Competency-Based Medical Education: Proposal for a Proof-of-Concept Study. study aims to develop a systemic understanding of a Formative Assessment as an Instructional Tool (FAIS) implemented in a biochemistry course in the Basic Medical Sciences component of an undergraduate. The educational intervention in question is an FAIS, which is implemented in a biochemistry course in the first semester of a 6-year bachelor of medicine, bachelor of surgery program. Results show the participating students' attitudes in relation to the usefulness of FA in achieving competency goals and in fostering self-directed learning and concluded Our findings will generate evidence regarding the application of FAs, which other medical educators can leverage in contexts similar to those under investigation.

Venugopal V and Dongre AR (2020)[13] conducted a study on the Effect of Interactive Lectures and Formative Assessment on Learning of Epidemiology by Medical Undergraduates – A Mixed-Methods Evaluation. The study focuses on assessing the effect of improved course (interactive lectures and formal FA) in epidemiology on student learning and attendance. Students were subjected to two written FAs during the epidemiology course. Questions testing all domains of cognition were included. They provided written feedback to all students, highlighting their strengths and areas for improvement. The conclusion of the study there is a little improvement in a traditional epidemiology course for undergraduates in the form of interactive lectures and formative feedback and providing the student with course material led to significant gains in students' knowledge and attendance.

RESEARCH METHODOLOGY

This chapter outlines the research methodology employed, to evaluate the effectiveness of a competency-based formative assessment tool for the skills in Community Medicine training of undergraduate medical students. It encompasses the research design, setting, sample, study population, study tool, the procedure of the study, ethical considerations, and data analysis.

Study Design: Quantitative

Research setting: The study was conducted in the Shri Sathya Sai Medical College and Institute, Ammapettai, Chengalpet, Tamil Nadu.

Study population: Phase II and Phase III part 1 MBBS students (Control group 1: Non CBME admission year 2018-19, Control group 2: CBME batch admission year 2019-2020 and Intervention group- 2020-21)

Sample technique: Universal Sampling (Included all the Phase II and Phase III part I MBBS students in the study

Sample size: The final OSCE Control group 1 consisted of 136 students, Control group 2 had 121 students, and the Intervention group had 88 students. The final sample size was 345.

Inclusion criteria: Phase II and Phase III part 1 MBBS undergraduate students

Exclusion criteria:

- Additional batch 2nd and 3rd year undergraduate students.
- Students are not willing to participate

Data collection procedure

STEP -1

SELECTION OF THE COMPETENCY AND TOOL

Competency chosen using the Delphi technique. Minimum UG teaching experience of 5 years in a Medical college after his MD in Community Medicine. Completed additional courses in Medical education or is an MEU member in the Medical College. We purposively selected a panel of experts (n=6), including academic and subject experts. Before starting the technique, the study protocol, including the Need for the study, was sent to all panel experts, and informed consent was obtained from them.

Round 1 – Open-Ended Input

CBME curriculum, template, suggested competencies, training and assessment methods sent to the experts; experts proposed 19 competencies.

Delphi Rounds 2–4 & Consensus

After Round 1, the experts' competencies were circulated for the selection of the competency, and open-ended questions were also included for suggestions in Round 2. The experts rated each competency (using a rating scale of 0 [strongly disagree] to 5 [strongly agree]) for the relevant formative assessment in community Medicine. At the end of each round, the median ratings received are shared with the experts. The comments were also anonymously shared. The iterative process continued until a consensus point was reached. Consensus was predefined when 70% of the experts gave a rating of 4 or above. If the competency failed to achieve consensus after being rated in 2 consecutive rounds, it was excluded. After the 4-round final, the 12 competencies were selected and matched with the training method, the Assessment tool for formative assessment, and the final evaluation, OSCE/OSPE.

S.No	Competency number	Competency
1	1.9	Demonstrate the role of effective Communication skills in health in a simulated environment
2	1.10	Demonstrate the important aspects of the doctor patient relationship in a simulated environment
3	2.1	Describe the steps and perform clinico socio-cultural and demographic assessment of the individual, family and community
4	2.2	Describe the socio-cultural factors, family (types), its role in health and disease & demonstrate in a simulated environment the correct assessment of socio-economic status
5	2.3	Describe and demonstrate in a simulated environment the assessment of barriers to good health and health seeking behavior
6	3.2	Describe concepts of safe and wholesome water, sanitary sources of water, water purification processes, water quality standards, concepts of water conservation and rainwater harvesting
7	3.3	Describe the etiology and basis of water borne diseases /jaundice/hepatitis/ diarrheal diseases
8	3.7	Identify and describe the identifying features and life cycles of vectors of Public Health importance and their control measures
9	4.3	Demonstrate and describe the steps in evaluation of health promotion and education program
10	5.2	Describe and demonstrate the correct method of performing a nutritional assessment of individuals, families and the community by using the appropriate method
11	5.4	Plan and recommend a suitable diet for the individuals and families based on local availability of foods and economic status, etc in a simulated environment
12	8.6	Educate and train health workers in disease surveillance, control & treatment and health education

STEP -1 (b) Selection of tool

We selected the two tools for the formative assessment. One is Case Based Discussion (CBD) and DOPHP (Direct Observed Public Health Practice) developed by the Faculty of public health, United Kingdom

The face validity of the tool was assessed by consulting experts in the fields of community medicine and medical education. To rate the tool on a 5-point Likert scale, ranging from 1 to 5, with one being entirely inappropriate and five being completely appropriate.

STEP -1 (c)

To match the formative assessment tool for each skill-based competency with the teaching learning method for the training, tool for formative assessment and the final assessment , post test, OSCE /OSPE

STEP -2 :**Baseline Data Collection for Interventional and Control Groups**

To assess the prior academic abilities of students and ensure comparability between the intervention and control groups. To assess whether the intervention had a significant impact on their performance compared to their baseline achievements. Baseline data, including 12th standard marks, NEET scores, and Phase 1 MBBS total marks, were collected from all students in both the intervention and control groups.

Step 3- Sensitization of assessors and students on Formative Assessment

Faculty underwent a 4-hour sensitization session (Workshop) on formative assessment tools, including Case-Based Discussion (CBD) and Direct Observation of Public Health Practice (DOPHP). The session covered the usage, procedures, and training required for implementing these tools, along with guidelines on the dos and don'ts during implementation and feedback procedures.

The intervention group participated in a 4-hour sensitization session focusing on the formative assessment tools, including their purpose and benefits, as well as the objectives and benefits of the study.

STEP - 4

Training of competency: The interventional group was trained on 12 selected competencies during Phase II MBBS using the mentioned methods. Faculty members from the Department of Community Medicine were actively involved in the training process.

Cognitive domain competencies were covered through large-group and small-group teaching sessions. Affective domain competencies were addressed through small-group teaching using scenario-based role play. Scenarios were created, and the script was validated by the academic and subject experts. The role plays were performed by the students themselves and also by simulated patients. Feedback was provided to students to enhance their learning. Communication skills training was conducted using the Kalamazoo scale. Students were trained based on the scale. Some competencies were reinforced through carefully selected video clips.

STEP – 5 Implementation of the formative assessment tool

Formative was implemented in Phase III MBBS Part 1 for 11 months. Case-Based Discussions (CBD) during clinical postings and Direct Observation of Public Health Practices (DOPHP) during small group teaching sessions. For Case-Based Discussions, pre-developed simulated cases based on real patient histories and investigations were utilized to ensure standardization and clinical relevance. In the clinical postings, competency for assessment through CBD. Each student was exposed to five cycles for each competency. Each faculty member facilitated a group of five students per round of discussion. Over the course of the clinical postings, all five competencies were systematically covered through case-based discussions. Feedback was provided to students at the end of each cycle to help.

The Direct Observation of Public Health Practices (DOPHP) was implemented over 11 months. The assessment covered seven competencies. The assessment was conducted during small group teaching sessions for interactive learning. A total of 13 assessors were involved in the DOPHP process, with each faculty member overseeing a group of 8 students. The assessments were based on simulated cases, designed to reflect real-world public health scenarios. Each competency was assessed over five

cycles, providing students with repeated opportunities to practice their skills and receive constructive feedback

STEP -6 (a) DEVELOPMENT OF OSCE STATION AND VALIDATION

OSCE stations were developed by the three faculty members from the community medicine department based on the competencies selected for formative assessment. The OSCE stations were discussed in multiple rounds with all faculty members in the department and finalized based on their inputs. The stations were then validated by academic and subject experts.

Each station and checklist was evaluated by a panel of six experts on a scale from 1 to 5. The ratings were defined as follows: 1 = non-relevant, 2 = relevant but needs minor revision, 3 = relevant, 4 = relevant, and 5 = highly relevant and appropriate. The rest of 3, 4, and 5 were deemed acceptable. The station checklist was accepted based on a predefined criterion of ≥80% for each item. If 4 or more than 4 experts scored 3 to 5 for the item, the item was accepted. Scored (1 and 2) discarded or modified

STEP -6 (b) OSCE

After the implementation of formative Assessment, the Objective Structured Clinical Examination (OSCE) was conducted at the end of Phase III MBBS Part 1. The examination involved 12 validated competency-based OSCE stations, with simulated patients and assessors from the Department of Community Medicine participating.

STEP -6 (c) FEEDBACK

Feedback on the formative assessment tool was collected from students and faculty using a combination of a Likert scale and open-ended questions.

Data analysis

The data were entered in MS Excel; organized, tabulated and statistically analyzed using SPSS (Statistical Package for the Social Sciences, version 20, SPSS). Categorical variables such as age, gender and attendance were presented using Frequency and percentage & continuous variables such as baseline and OSCE marks were presented using mean and standard deviation. Comparison of mean baseline

scores, mean OSCE scores and mean attendance of the students between three groups (intervention, CBME control & non CBME control) was done using ANOVA and Independent T-test was used for comparing two groups (intervention and control group). A p-value of ≤ 0.05 was considered to be statistically significant. Pearson correlation coefficient was used to find out the correlation between attendance and OSCE marks of the students.A content analysis of the responses to open- ended questions in the feedback was performed and is presented in terms of frequencies and percentages

Ethical Considerations

Approval from the SSSMCRI ethical committee was obtained prior to the study. Permission was secured from the Head of the Institution and the Head of the Department of Community Medicine, SSSMCRI. All participating students and assessors were informed about the study's purpose, benefits, procedures, and confidentiality measures in their understandable language. Written informed consent was obtained from students and assessors who voluntarily agreed to participate. To ensure objectivity, the research scholar did not participate as an assessor or examiner during the OSCE evaluations.

RESULTS

In the study, a total of 345 students (Intervention: 88, CBME control: 121, and Non-CBME control: 136) participated. Table 1 shows the age distribution of the participants.

Table 1: Age distribution of the students

Age of the students (in years)	Intervention group (N=88)	CBME control (N=121)	Non-CBME control (N=136)
20	5 (5.7)	5 (4.1)	111 (81.6)
21	73 (83)	105 (86.8)	19 (14)
22	5 (5.7)	9 (7.4)	4 (2.9)
23	5 (5.7)	2 (1.7)	2 (1.5)
Mean age (SD)	21.11 (0.58)	21.07 (0.42)	20.24 (0.58)
Median (IQR)	21 (21-21)	21 (21-21)	20 (20-20)
Range (Min-Max)	3 (20-23)	3 (20-23)	3 (20-23)

Baseline data (12th Mark, NEET score, and 1st-year summative mark) of the students were collected, and no significant changes were observed among the participants (ANOVA). This indicates that the cohort is similar. Table 2 shows the baseline marks of the participants.

Table 2: Baseline marks of the participants

Comparison of Groups		Hsc	NEET	1st year MBBS
Three groups	ANOVA F	0.86	0.27	0.57
	P value	0.42	0.77	0.56
Intervention & CBME control	t-test value	-0.62	-0.42	-0.73
	p value	0.54	0.67	0.46
Intervention & non-CBME control	t-test value	0.41	-0.67	-0.99
	p value	0.68	0.49	0.32
Comparison of CBME control & non-CBME control	t-test value	1.96	-0.36	-0.43
	p value	0.05	0.72	0.66

In the comparison of the final OSCE marks, the intervention group had better performance in the final OSCE (Intervention 31.67, CBME control 22.39 and Non-CBME 18.29).. Comparison of all three groups is statistically significant (ANOVA F=597.78, p value <0.001). Table 3 shows the comparison of OSCE marks.

Table 3: Comparison of Total OSCE marks of intervention and comparison groups

Groups		OSCE marks	
		Mean	**SD**
Intervention group (N=88)		31.67	1.70
CBME control (N=121)		22.39	3.92
Non CBME control (N=136)		18.29	2.46
Comparison of three groups	ANOVA F statistics	567.78	
	p value	<0.001*	
Post Hoc Test (Tukey HSD)			
Comparison of intervention & CBME control	Mean difference (95% CI)	9.27 (8.45-10.08)	
	p value	<0.001*	
Comparison of intervention & non-CBME control	Mean difference (95% CI)	13.38 (12.59-14.18)	
	p value	<0.001*	
Comparison of CBME control & non-CBME control	Mean difference (95% CI)	4.11 (3.38-4.84)	
	p value	<0.001*	

The OSCE marks of each station are compared with all groups, showing that the mean marks of the intervention group perform better than those of the control groups and are statistically significant. Table 4 shows the comparison of the performance of students in each OSCE station

Table 4: Comparison of the performance of students in each OSCE station

Station	OSCE score-Mean (SD)			ANOVA F; p value	Post Hoc Test (Tukey HSD) Mean difference; p value		
	Intervention (N=88)	CBME control (N=121)	Non-CBME control (N=136)	Comparison of three groups	Intervention Vs CBME control	Intervention Vs non-CBME control	CBME Vs non-CBME control
1	2.67 (0.47)	1.91 (0.76)	1.57 (0.77)	65.97; <0.001*	0.77; <0.001*	1.10; <0.001*	0.34; <0.001*
2	2.65 (0.50)	1.9 (0.81)	1.5 (0.71)	71.46; <0.001*	7.68; <0.001*	13.21; <0.001*	4.22; <0.001*
3	2.56 (0.48)	1.68 (0.72)	1.49 (0.68)	78.15; <0.001*	17.66; <0.001*	12.83; <0.001*	2.17; 0.03*
4	2.64 (0.52)	1.88 (0.76)	1.55 (0.83)	58.61; <0.001*	8.10; <0.001*	10.99; <0.001*	3.31; 0.001*
5	2.66 (0.53)	1.76 (0.79)	1.52 (0.76)	69.47; <0.001*	9.27; <0.001*	12.27; <0.001*	2.48; 0.01*
6	2.65 (0.49)	1.79 (0.74)	1.54 (0.71)	77.31; <0.001*	9.49; <0.001*	12.81; <0.001*	2.76; 0.006*
7	2.60 (0.39)	1.94 (0.80)	1.59 (0.82)	52.39; <0.001*	7.14; <0.001*	10.78; <0.001*	3.45; <0.001*
8	2.72 (0.45)	1.86 (0.78)	1.45 (0.65)	100.82; <0.001*	9.28; <0.001*	16.01; <0.001*	4.59; <0.001*
9	2.59 (0.46)	1.96 (0.78)	1.61 (0.77)	51.51; <0.001*	6.77; <0.001*	10.76; <0.001*	3.62; <0.001*
10	2.61 (0.54)	1.95 (0.75)	1.50 (0.73)	68.63; <0.001*	7.03; <0.001*	12.25; <0.001*	4.87; <0.001*
11	2.6 (0.55)	1.86 (0.72)	1.47 (0.78)	69.39; <0.001*	8.08; <0.001*	11.82; <0.001*	4.15; <0.001*
12	2.71 (0.44)	1.92 (0.83)	1.51 (0.73)	77.41; <0.001*	8.89; <0.001*	13.75; <0.001*	4.21; <0.001*

The final performance in the OSCE for the intervention group was not significantly different from the baseline marks. It is not statistically significant (p-value 0.44). Table 5 shows the comparison of OSCE marks of high, medium and low performing students in the intervention group.

Table 5: Comparison of OSCE marks of high, medium and low performing students in the intervention group

Performance category based on 1st yr Summative Assessment (N=88)	Mean OSCE score	Standard Deviation	ANOVA p value
High performers (N=29)	31.36	1.65	0.44
Medium performers (N=29)	31.93	1.61	
Low performers (N=30)	31.72	1.85	

In the formative assessment, 86 (97.7%) students have an attendance of more than 75% Table 6 &7 show the overall attendance of the students in the Formative assessment, and it is statistically significant ($p < 0.001$).

Table 7: Comparison of mean OSCE marks% of the students based on the attendance%

Attendance %	OSCE marks %		
	Mean	**Standard Deviation**	**p-value based on t test**
Less than or equal to 75%	46.25	0.59	0.001*
More than 75%	53.06	2.58	

Feedback about the formative assessment was collected from the faculty. The majority of the faculty (12), 92.3% agreed that students participated in the formative assessment with full involvement and also suggested that the formative assessment continue for the upcoming batches. Table 8 shows the faculty feedback about formative assessment.

Table 8: Faculty Feedback about formative assessment tools (N=13)

Criteria	Feedback about Formative Assessment		
	Excellent/Strongly agree	Good/Agree	Fair/Neutral
Experience about FA tool?	6 (46.1)	7 (53.9)	0(0)
Did the student participate in Formative assessment with full involvement?	4 (30.8)	8 (61.5)	1 (7.7)
Whether time is enough to give feedback to student?	3 (23.1)	8 (61.6)	2 (15.3)
Will you suggest Formative tool in future to continue for coming batch students?	4 (30.7)	8 (61.5)	1 (7.8)
Whether Formative assessment helped to student perform well in final OSCE?	4 (30.8)	9 (69.2)	0(0)
Overall experience	5 (38.4)	8 (61.5)	0(0)

Among the students majority of them 82 (93.1%) answered the assessor feedback helped in the subject improvement and also they agreed the formative assessment helped in the final OSCE performance. Table 9 shows the student feedback on the formative assessment.

Table 9: Student feedback about the Formative Assessment tool (N=88)

Criteria	Feedback about Formative Assessment		
	Excellent/Strongly agree	**Good/Agree**	**Fair/Neutral**
Experience about Formative assessment tool?	21 (23.9)	59 (67)	8(9.1)
Whether assessor feedback/ suggestions are helped to improve your subject/Competency?	13 (14.8)	69 (78.4)	6 (6.8)
Is there enough time for Formative assessment?	25 (28.4)	55 (62.5)	8 (9.1)
Will you suggest Formative assessment in future to continue for coming batch students?	8 (9.1)	76 (86.4)	4 (4.5)
Whether Formative assessment helped you to perform well in your final OSCE?	12 (13.6)	70 (79.5)	6(6.8)
Overall experience	26 (29.5)	58 (65.9)	4(4.5)

DISCUSSION

1. Selection of competency for the Formative Assessment

As per CBME curriculum 2019, there is no certified competency in the subject Community Medicine, even though community medicine is one of the important subjects, because it plays an important role in the prevention of disease. In this study, which employed the Delphi method, a panel of six experts in community medicine identified the 12 most important competencies in public health out of a total of 107 competencies. These selected competencies encompass all three domains: cognitive, affective, and psychomotor. As per the CBME curriculum 2024, 136 competencies are listed in community medicine, and 10 competencies are certified. The 8 competency has already been chosen as a competency for FA in our study.

Hemant Deepak Shewade (2017) According to the study findings, it aligns with a study on Competency-based tool for evaluation of community-based training in undergraduate medical education in India – a Delphi approach They identified the 7 domains and 74 itemsThe domains (number of items) were Public health – epidemiology and research methodology (13), Public health – biostatistics (6), Public health administration at primary health center level (17), Family medicine (24), Cultural competencies (3), Community development and advocacy (2), and Generic competence (9).[14]

2. To implement the formative assessment tool during the community medicine posting of the students

In this present study, Formative assessment tool was implemented in the undergraduate medical students in the CBME curriculum in community medicine. The better outcome for the students in the performance of the skills in the selected competency. In all 12 competencies, after implementing the Formative assessment an increase in the mean marks in the OSCE, e.g., Competency One Intervention: mean: 2.65 (SD: 0.47), control (CBME 1.91 (SD: 0.76) and Non-CBME 1.57 (SD: 0.77). And it's statistically significant (<0.001). SH Alkalash (2023) According to the study findings, it aligns with a study on the the Application of workplace-based assessment for family medicine postgraduate students in faculty of Medicine Menoufia university

Implementation of a monthly MINICEX and DOPS for family medicine postgraduates (N. 21) (from January to March 2020) with a total of 105 feedbacks from Mini-CEX (N.63) and DOPS (N.42 feedbacks of DOPS about adult CPR) were collected and analyzed. Finally, students' satisfaction with the application of WBAs was assessed. A significant improvement was detected in MINICEX and DOPS feedback scores of the postgraduates. About 93%of students recommended its application for other medical students, and 86% of them requested to perform it again for different cases and procedures.[15]

3. **To compare the student performance trained with and without the intervention**

In this present study, the formative assessment was implemented in the undergraduate medical students in the CBME curriculum in community medicine. The better outcome for the students in the performance of the skills in the selected competency. In all 12 competencies, after implementing the formative assessment, an increase in the mean marks in the OSCE, e.g., Competency One Intervention: mean: 2.65 (SD: 0.47), control (CBME 1.91 (SD: 0.76) and Non-CBME 1.57 (SD: 0.77). And it's statistically significant (<0.001). S Bhattacharya (2021) According to the study findings, it aligns with a study Performance of Undergraduate Medical Students in Formative and Summative Evaluations in Community Medicine in a Medical College in India. To explore the correlation of performance in continuous formative assessments and final summative evaluation in third-year professional MBBS students in community medicine.

The strong and significant correlation (r = 0.64) between the sixth semester and internal examination results suggests the importance of the sixth semester examination in preparing for finals. The formative examination in community medicine, which spans a total of three and a half years, plays a crucial role in preparing students for the finals, particularly in achieving good scores.[16]

4. **To evaluate the relationship between the number of formative assessment sessions and OSCE performance**

In our study, we compared the attendance of the formative assessment in the final OSCE. Divided the attendance percentage above 75% and below 75% in the

formative assessment. Students who have participated more in the formative assessment. They perform significantly higher in the final OSCE. Less than 75% (Mean marks 76.25, SD-0.59), More than 75% (Mean marks -53.06, SD- 2.58) P=0.001*. And Pearson correlation coefficient value 0.79. Monica Wassim (2023) According to the study findings, it aligns with a study Impact of Formative Objective Structured Clinical Examination (OSCE) on Clinical Performance of Undergraduate Medical Students in Summative OSCE. To investigate the impact of having a formative OSCE on clinical performance in the final main summative OSCE, as measured by grades, comparing students who attended the formative OSCE to those who did not. The number of formatives attended was connected with higher percentage scores on the OSCE grades in general. Formative OSCEs exhibited an 84.5%-91.3% positive predictive value for passing the summative OSCE.[17]

5. **To compare the traditional and competency-based medical education batch students in OSCE performance**

In our study, we compared the performance of traditional batch and CBME batch students in the final OSCE. Final OSCE marks, Intervention group Mean score-31.67 SD (1.70), For CBME control 22.39 (3.92) and Non CBME control- 18.29 (2.46). The intervention group had better performance than both control groups. But among the controls, CBME controls perform better than non-CBME controls. So, the Competency-Based Medical curriculum shows an impact on the skills among the medical students. S Pandit (2019), According to the study findings, it aligns with a study, A crossover comparative study to assess efficacy of competency-based medical education (CBME) and the traditional structured (TS) method. To demonstrate improvement in the performance of students using CBME as a teaching tool over the traditional structured method (TS). The mean scores for CBME were higher than for TS, with an estimated treatment effect of 22.1625 and an average improvement of 11% in scores.[18]

SUMMARY AND CONCLUSION

This study evaluated the effectiveness of competency-based formative assessment tools—Case-Based Discussions (CBD) and Direct Observation of Public Health Practices (DOPHP)—in enhancing the skills of undergraduate medical students during their Community Medicine training. Since the interns were assessed with exit OSCE by the Institution, the same method was chosen to be the performance indicator for both study group and control group with and without intervention. Adopting an experimental design, the research compared an intervention group (CBME batch, n = 88) with two control groups (Non-CBME, n = 136; CBME-control, n = 121). Twelve key competencies were selected through a Delphi consensus involving six experts, ensuring alignment with the Competency-Based Medical Education (CBME) curriculum. The intervention group underwent structured training and cyclical assessments using CBD and DOPHP over 11 months, followed by an Objective Structured Clinical Examination (OSCE) to measure outcomes. Results demonstrated statistically significant improvements ($p<0.05$) in OSCE performance for the intervention group compared to controls, with a positive correlation between attendance in formative assessments and higher OSCE scores. Feedback from students and faculty indicated strong approval (85%) for the feasibility and utility of these tools.

ABSTRACT

Background: Formative assessment is a key component of Competency-Based Medical Education, as it focuses on identifying and addressing knowledge, skills, and attitude gaps through continuous evaluation and constructive feedback. This study aims to evaluate the effectiveness of a competency-based formative assessment tool for the skills in Community Medicine training of undergraduate medical students.

Methodology: Experimental study conducted among the Phase II and Phase III part 1 MBBS students at a private medical college. The intervention group was trained, and five cycles of the formative assessment tool (Case-Based Discussion and Direct Observed Public Health Practice) were used for 12 competencies. The final OSCE was conducted for 12 competencies and compared with two control groups (CBME and Non-CBME), and feedback was obtained from the intervention group. Data analyzed using SPSS software version 20.

Results: A total of 345 students participated in the study (Intervention:88, CBME control: 121 and Non-CBME: 136). Mean marks in the OSCE are 31.67, 22.39, and 18.29 for the Interventional group, CBME control, and Non-CBME control, respectively, and this difference is statistically significant (<0.001). The majority of the students, 86 (97.7%), in the intervention group, have attendance of more than 75% in the formative assessment and mean marks (53.06) in the OSCE, compared with below 75 % attendance (46.25), and this difference is statistically significant (p value =0.001). Most of the faculty agreed that this Formative assessment was helpful for students to learn deeply and acquire competencies easily. The majority of students provided feedback indicating that formative assessment was helpful in learning, improved understanding, and facilitated better retention.

Conclusion: The Formative assessment tool is routinely incorporated into teaching and learning methods in community medicine, and different assessment tools should be selected for formative assessment across other competencies in Community Medicine.

Key words: Formative assessment, Community Medicine, Competency

REFERENCES

1. Park K. Concept of health and disease. Park 's textbook of Preventive and Social Medicine. 25th edition. Jabalpur: Banarsidas Bhanot Publishers; 2019: 45–46.

2. Meyer EC. Community medicine and public health. Am J Public Health (N Y) 1920;10:489–97

3. Sadawarte MK, Kakeri MK, Nandanwar DY. Community medicine: perceptions among medical students and career preference: a cross-sectional study. Int J Community Med Public Health 2017;4:4577-82

4. Soanes C, Stevenson A, editors. The Oxford Dictionary of English. Revised Edition. Oxford, UK: Oxford University Press; 2005.

5. Frank JR, Mungroo R, Ahmad Y, Wang M, De Rossi S, Horsley T. Toward a definition of competency-based education in medicine: A systematic review of published definitions. Med Teach. 2010;32:631–74

6. Medical Council of India, Competency-based Undergraduate curriculum for the Indian Medical Graduate, 2018. Vol. 1; 15

7. Primhak R, Gibson N. Workplace-based assessment: how to use case-based discussion as a formative assessment. Breathe (Sheff). 2019;15(2):163-66.

8. Ende J. Feedback in clinical medical education. JAMA. 1983;250(6):777-81.

9. Brits H, Bezuidenhout J, Van der Merwe LJ, Joubert G. Assessment practices in undergraduate clinical medicine training: What do we do and how can we improve?. Afr J Prm Health Care Fam Med. 2020;12(1), a2341
10. Shunmugam J, Gurupatham D.Assessment of competency of medical students in community medicine. Int J Community Med Public Health 2016;3:99-103.

11. Zhang Y, Huang T, Tang M, Meng L, Wu X, Chen K. An effectiveness evaluation of a community-based course for medical students: a randomized controlled trial in the teaching of epidemiology. BMC Med Educ. 2023;23:807.

12. Otaki F, Gholami M, Fawad I, Akbar A, Banerjee Y. Students' perception of formative assessment as an instructional tool in competency-based medical education: proposal for a proof-of-concept study. JMIR Res Protoc. 2023;12:e41626
13. Venugopal V, Dongre AR. Effect of interactive lectures and formative assessment on learning of epidemiology by medical undergraduates – A mixed-methods evaluation. Indian J Community Med 2020;45:526-30.
14. Shewade HD, Jeyashree K, Kalaiselvi S,Palanivel C, Panigrahi KC. Assessment of community-based training of medical undergraduates: Development and validation of a competency-based questionnaire. Educ Health 2016;29:244-9
15. Alkalash SH, Farag NA. Application of workplace-based assessment for family medicine postgraduates students in faculty of medicine Menoufia university. J Clin Images Med Case Rep. 2023; 4(1): 2230.
16. Bhattacharya S, Mondal S, Mitra K. Performance of undergraduate medical students in formative and summative evaluations in community medicine in a medical college in India. J Med Edu. 2021;20(4):e119718.
17. Wassim M, Ghazal F, Mostafa NS, Reda R. Impact of Formative Objective Structured Clinical Examination (OSCE) on Clinical Performance of Undergraduate Medical Students in Summative OSCE. Educ Res Innov J. 2023;3(11):1-14
18. Pandit S et al, . A crossover comparative study to assess efficacy of competency-based medical education (CBME) and the traditional structured (TS) method in selected competencies of living anatomy of first-year MBBS curriculum: A pilot study. Med J Armed Forces India. 2019;75(3):259-265

ANNEXURES

Original Article

Perception of Faculty about Skills Assessment in Community Medicine for Medical Undergraduate Students

Pragadeesh Raja V[1,2], Shivasakthy M[3,4], Sindhuri R[5,6], Lavakumar S[7,8]

[1]Assistant Professor of Community Medicine, Father Muller Medical College, Mangalore, Karnataka, [2]Ph.D. Research Scholar, Sri Balaji Vidyapeeth (Deemed-to-be University), [3]Director, Institute of Health Professions Education (IHPE), Sri Balaji Vidyapeeth (Deemed to be University), [4]Department of Prosthodontics, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth (Deemed to be University), [5]Associate Professor of Community Medicine, PSP Medical College Hospital and Research Institute, Chennai, Tamil Nadu, [6]MHPE Scholar, IHPE, Sri Balaji Vidyapeeth (Deemed-to-be University), [7]Professor, Department of Pharmacology, MEU Coordinator, Shri Sathya Sai Medical College and Research Institute, Chengalpattu, Tamil Nadu, [8]Sri Balaji Vidyapeeth (Deemed to be University) Pondicherry, India

Abstract

Context: Since learning is a complex process, there are instances, in which a certain study strategy may not be suitable. Effective learning stems from a passion for the material and judicious application of study strategies. Conventional assessment methods did not observe the clinical performance directly in day-to-day practice and if observed, were not accompanied by any feedback. **Objectives:** The objective of this study was to list the important skills to be assessed in preventive and social medicine from the perspective of preventive and social medicine faculties, to list the tools used for skill assessment in community medicine from the faculty's perspective, and to explore the challenges in the implementation of skills assessment and its solution. **Materials and Methods:** This is qualitative exploratory study conducted among faculties of community medicine from various medical colleges in India. Duration of 2 months duration from August 2022 to September 2022. A total of 45 community medicine faculties participated in the study. The study tool was an open-ended, standardized, pretested questionnaire. Data analysis by free listed items for community medicine skills and skill assessment tools were entered in visual Anthropac free list software separately for Junior and senior faculties. Salient items were identified based on Smith's Salience Score for each group separately. **Results:** The mean age of participants was 35.84 35.84± (6.8) standard deviation years, ranging from 28 to 61 years. Among them, 24 (53.3%) were females and 21 (46.7%) were males. Communication skills and clinical skills were stated by both junior and senior faculties as the salient skills to be assessed in undergraduate medical students. Objective structured clinical examination, objective structured practical examination, and direct observation of procedural skill were chosen by both the faculty groups for assessment of skills. The common challenges for implementing skill assessment were lack of interest and motivation in students and faculties and lack of training of staff. The solutions suggested by them were motivating the students and staff with incentives and prizes and conducting a faculty development program for skills assessment. **Conclusions:** Proper planning and implementation of skill teaching and assessment should be carried out, with regular faculty development programs conducted by the institution, and solutions to barriers identified. To encourage students to learn skills in community medicine and undergo frequent formative assessments without causing boredom.

Keywords: Assessment, learning, skills

Introduction

Since learning is a complex process, there are instances, in which a certain study strategy may not be suitable. Effective learning stems from a passion for the material and judicious application of study strategies.[1] There have been reports all over the world of using creative study skills and techniques to enhance students learning. Many educational institutions around the world realized the importance of teaching and assessment of skills and have moved to a competency-based curriculum. The competency-based curriculum ensures the successful completion of the course and the attainment of professional competence.

Address for correspondence: Dr. Pragadeech Raja V, Assistant Professor, Department of Community Medicine, Father Muller Medical College, Mangalore - 575 002, Karnataka, India.
E-mail: vpragadeechraja@gmail.com

Submitted: 08-Dec-2023 **Revised:** 08-Mar-2024
Accepted: 07-Mar-2024 **Published:** 31-Mar-2025

Access this article online

Quick Response Code:

Website: https://journals.lww.com/dmms

DOI: 10.4103/jdmimsu.jdmimsu_795_23

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Raja VP, Shivasakthy M, Sindhuri R, Lavakumar S. Perception of faculty about skills assessment in community medicine for medical undergraduate students. J Datta Meghe Inst Med Sci Univ 2025;20:54-9.

Original Article

Insights and Challenges Faced by the Faculty in the Implementation of Formative Assessment - Mixed Method Study

Veerappan Pragadeesh Raja[1,2], Shivasakthy Manivasakan[3,4], Raghavan Sindhuri[5,6], Lavakumar Somu[7], Dharani Lenin[8]

[1]Assistant Professor of Community Medicine, Father Muller Medical College, [6]Senior Resident, Critical Care Medicine, KMC Hospital, Mangalore, Karnataka, [2]Ph.D. Research Scholar, Sri Balaji Vidyapeeth (Deemed-to-be University), [3]Director, Institute of Health Professions Education (IHPE), Sri Balaji Vidyapeeth (Deemed to be University), [4]Professor, Department of Prosthodontics, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth (Deemed to be University), [5]Associate Professor of Community Medicine, PSP Medical College Hospital and Research Institute, Chennai, [8]MHPE Scholar, IHPE, Sri Balaji Vidyapeeth (Deemed-to-be University), [7]Professor, Department of Pharmacology, Shri Sathya Sai Medical College and Research Institute, Chengalpattu, Tamil Nadu, Sri Balaji Vidyapeeth (Deemed to be University) Pondicherry, India

Abstract

Background: The term assessment refers to a systematic way of gaining information about student learning, using a variety of methods and procedures. Formative assessments (FAs) are conducted at regular intervals in the academic year with the express objective of giving students feedback, so they can understand and track their own progress. Summative assessments generally serve as an indicator to ensure that a student has met the minimum requirement for progression to the next stage of study. **Objectives:** To find out the practice of FA among medical college faculty in India and to explore the challenges in the implementation of FA in medical colleges in India and solutions to overcome it from faculty's perspective. **Materials and Methods:** It was a sequential mixed methods study conducted among faculties from various medical colleges. In Quantitative phase, an online questionnaire survey and in Qualitative phase, Key Informant Interviews were conducted among experts in medical education. The study was conducted from June 2023 through July 2023 for 2 months. A total of 230 medical faculties were included in the study. The data were analyzed using SPSS version 25 software package for quantitative data. Discrete variables were presented as frequency and percentages, and continuous variables as mean and standard deviation (SD). Thematic analysis of the transcripts was done manually by two authors trained in qualitative research to increase the trustworthiness in the results. **Results:** The mean age of participants was 38.6± (7.9) SD years. Among them, 103 (44.8%) were females and 127 (55.2%) were males. The mean teaching experience of the participants was 8.22± (6.6) SD years, ranging from 1 to 39 years. The majority of the participants was from private medical colleges 187 (81.3%). Among the faculties 126 (54.8%) of the participants conducted FA regularly, among the participants, 103 (44.8%) provided feedback to students regularly, and 127 (55.2%) received faculty development program. Lack of time, faculty not trained, and vast curriculum are some challenges. **Conclusion:** FA is the need of the hour and has been associated with multiple benefits. Although there are multiple challenges in its successful implementation, they can be overcome by proper planning and faculty development.

Keywords: Challenges, formative assessment, solutions, tools

Introduction

Assessment denotes a systematic approach to acquiring information regarding student learning through various methods and procedures. Since the 1950s, the process of assessment in medical education has evolved swiftly and dramatically. Many new assessment methods have been developed and used throughout this time, with an emphasis on clinical skills, communication skills, procedural skills, and professionalism. Assessments are typically categorized into two subtypes: formative assessment (FA) and summative. Both methods aim to evaluate a student's ability.[1] FAs are conducted at regular

Address for correspondence: Dr. Veerappan Pragadeech Raja, Assistant Professor of Community Medicine, Father Muller Medical College, Kankanady, Mangalore - 575 002, Karnataka, India.
E-mail: vpragadeechraja@gmail.com

Submission: 26-09-2024 **Revision:** 06-02-2025
Acceptance: 16-02-2025 **Published:** 30-06-2025

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Raja VP, Manivasakan S, Sindhuri R, Somu L, Lenin D. Insights and challenges faced by the faculty in the implementation of formative assessment - mixed method study. J Nat Sci Med 2025;8:181-6.

Access this article online

Quick Response Code:

Website: www.jnsmonline.org

DOI: 10.4103/jnsm.jnsm_149_24